

Structure and Properties of Atoms

PS-2 The student will demonstrate an understanding of the structure and properties of atoms.

PS-2.4 Use the atomic number and the mass number to calculate the number of protons, neutrons, and/or electrons for a given isotope of an element.

Taxonomy Level: 3.2-C Understand Procedural Knowledge

Key Concepts:

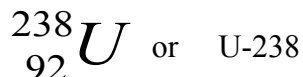
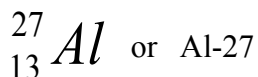
Mass number

Atomic number

Previous/Future knowledge: Students have not been introduced to this concept prior to Physical Science. Indicators PS-2.1, PS-2.2 and PS-2.3 are prerequisite for this indicator. Students must have a firm grasp of atomic number, mass number and how each of the three subatomic particles contributes to these values. It is also essential that students can interpret the mass number and the atomic number from the symbol for an isotope of an element. When given the symbol of an element, students must be able to determine the element's number of protons and electrons from the periodic table (PS-2.3).

It is essential for students to

- Use a periodic table and the equation: mass number = number of protons + number of neutrons to perform the following calculations:
 - o When given the symbol for an isotope of an element (which includes the element's symbol and the mass number of the isotope), determine the number of protons, neutrons, and electrons
 1. Determine the number of protons and the number of electrons from the periodic table
 2. Calculate the number of neutrons from the equation.
 - o When given the mass number and the number of neutrons for a particular isotope of an unknown element, write the symbol for the isotope.
 1. Use the above equation to calculate the number of protons.
 2. Use the number of protons to determine the number of electrons, and the identity of the element
 3. Write the symbol for the isotope



Teacher note: The mass number cannot be determined by rounding off the atomic mass.

Assessment Guidelines:

The objective of this indicator is to use the correct procedure to mathematically determine the number of protons, neutrons, and/or electrons in an isotope of an element when given the mass number and the atomic number of the isotope, therefore, the primary focus of assessment should be to apply this procedure for any given element.

In addition to *use*, assessments may require students to

- *identify* of the element, the mass number, the atomic number, and the number of electrons when given the number of protons and neutrons.